

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

--	--	--	--	--	--	--	--	--	--

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

ERT2016 - ENGINEERING MECHANICS (RE)

15 OCTOBER 2018
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This exam paper consists of only four printed pages, including this cover page.
2. Answer all questions.
3. Write all your answers in the answer booklet provided.

Question 1

a). A hoist trolley is subjected to the three forces shown in **Figure 1a**. Knowing that $P=250\text{ lb}$, determine:

- the required value of α if the resultant of the three forces is to be vertical,
- the corresponding magnitude of the resultant force.

[10 marks]

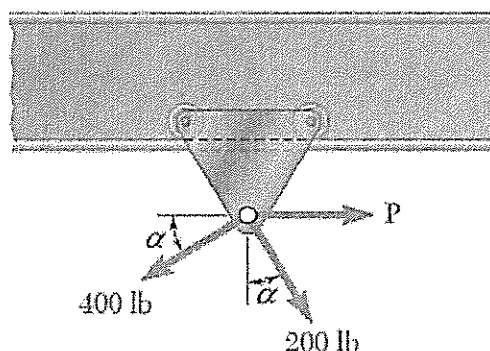


Figure 1a

b). Determine by direct integration the centroid of the area shown in **Figure 1b**. Express your answer in terms of a and b .

[10 marks]

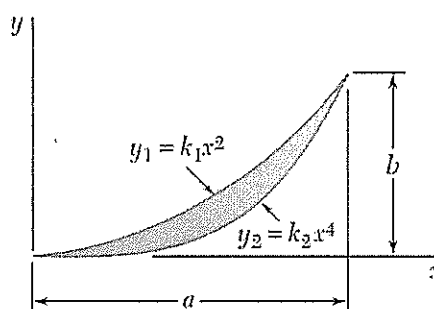


Figure 1b

c). A system consists of a movable bin and its contents with a combined weight of 2.8 kN is shown in **Figure 1c**. Sketch the free body diagram and determine the shortest chain sling ACB that can be used to lift the loaded bin if the tension in the chain is not to exceed 5 kN .

[5 marks]

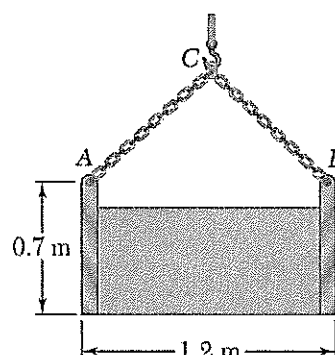


Figure 1c

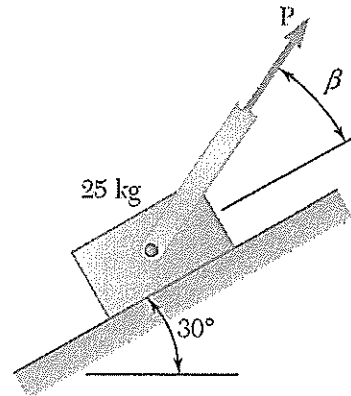
Continued . . .

Question 2

a). Knowing that the coefficient of friction between the 25-kg block and the incline is $\mu_s = 0.25$ in the system shown in **Figure 2a**, determine

- the smallest value of P required to start the block moving up the incline,
- the corresponding value of β .

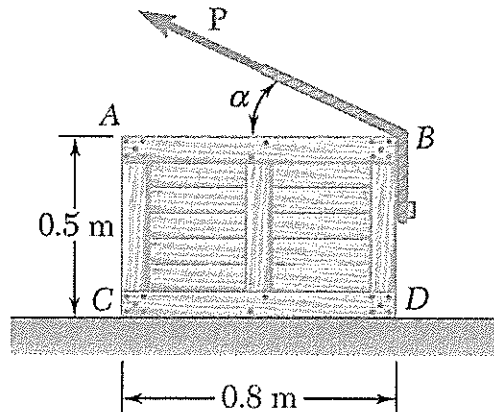
[10 marks]

**Figure 2a**

b). A 40-kg packing crate is pulled by a rope as shown in **Figure 2b**. The coefficient of static friction between the crate and the floor is 0.35. If $\alpha = 40^\circ$, determine

- the magnitude of the force P required to move the crate,
- whether the crate will slide or tip.

[15 marks]

**Figure 2b****Question 3**

a). Based on experimental observations, the acceleration, a , of a particle is defined by the relation $a = -(0.1 + \sin x/b)$, where a and x are expressed in m/s^2 and meters, respectively. Knowing that $b = 0.8 \text{ m}$ and that $v = 1 \text{ m/s}$ when $x = 0$, determine

- the velocity of the particle when $x = -1 \text{ m}$,
- the position where the velocity is maximum,
- the maximum velocity.

[10 marks]

Continued ...

b). Determine the maximum theoretical speed that may be achieved over a distance of 60 m by a car starting from rest, knowing that the coefficient of static friction is 0.80 between the tires and the pavement and that 60 percent of the weight of the car is distributed over its front wheels and 40 percent over its rear wheels. Assume

- four-wheel drive,
- front-wheel drive,
- rear-wheel drive.

[15 marks]

Question 4

a). A gear reduction system consists of three gears A, B, and C is shown in **Figure 4a**. Knowing that gear A rotates clockwise with a constant angular velocity $\omega_A = 600$ rpm, determine

- the angular velocities of gears B and C,
- the accelerations of the points on gears B and C which are in contact.

[10 marks]

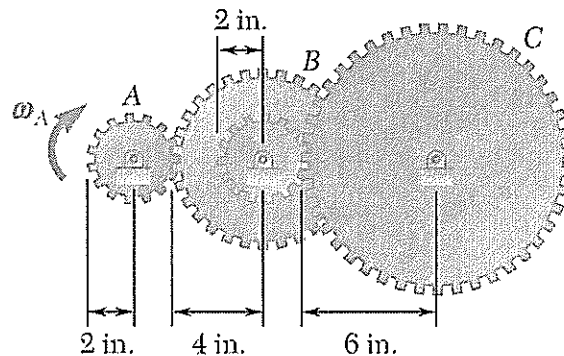


Figure 4a

b). A barrel and its contents have a combined mass of 90 kg. A cylinder C is connected to the barrel at a height $h = 550$ mm as shown in **Figure 4b**. Knowing $\mu_s = 0.40$ and $\mu_k = 0.35$, determine the maximum mass of C so the barrel will not tip.

[15 marks]

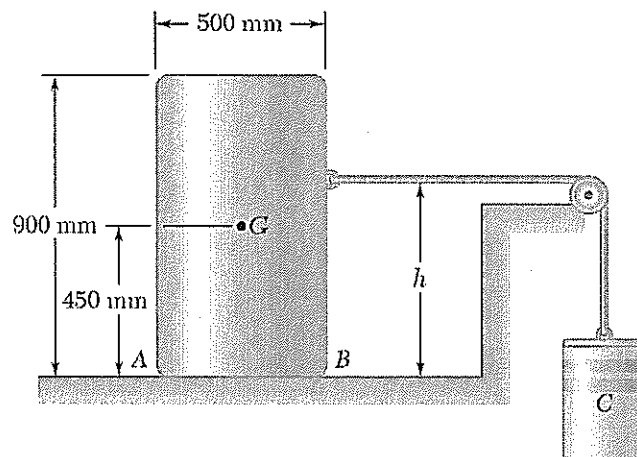


Figure 4b

End of Paper